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The influence of ammonium and methods for removal during the anaerobic treatment of poultry manure

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Abstract

The addition of exogenous NH4Cl to poultry manure and synthetic medium was used to study the effect of ammonia-nitrogen on the activity and composition of a methanogenic consortium. Results indicated that the production of biogas and methane was not affected by the variation in NH4Cl concentration within the range 2-10 g dm-3 (0.5-2.6 g N-NH4 dm-3). At higher values of ammonium (10-30 g dm-3 or 2-8 g N-NH, dm-3) a significant decline in both parameters (by 50-60% for biogas and 80-90% for methane) was observed. A significant decrease in the numbers of bacteria of all physiological groups (especially proteolytic and methanogenic) was observed when more than 30 g NH4Cl dm-3 (7.8 g N-NH4 dm-3) was added to the fermentation medium. The addition of 10% (w/v) of powdered phosphorite ore enhanced the production of biogas and methane at NH4Cl concentrations up to 30 g dm-3, and also changed the composition of the methanogenic consortium. A partial recovery in the numbers of proteolytic and methanogenic bacteria coupled with the decrease in the density of sulphate-reducers was observed. High concentrations (more than 50 g dm-3) of NH4Cl seemed to cause irreversible inhibition of methanogenesis which could not be eliminated by the addition of phosphorites. | The addition of exogenous NH4Cl to poultry manure and synthetic medium was used to study the effect of ammonia-nitrogen on the activity and composition of a methanogenic consortium. Results indicated that the production of biogas and methane was not affected by the variation in NH4Cl concentration within the range 2-10 g dm-3 (0.5-2.6 g N-NH4 dm-3). At higher values of ammonium (10-30 g dm-3 or 2-8 g N-NH4 dm-3) a significant decline in both parameters (by 50-60% for biogas and 80-90% for methane) was observed. A significant decrease in the numbers of bacteria of all physiological groups (especially proteolytic and methanogenic) was observed when more than 30 g NH4Cl dm-3 (7.8 g N-NH4 dm-3) was added to the fermentation medium. The addition of 10% (w/v) of powdered phosphorite ore enhanced the production of biogas and methane at NH4Cl concentrations up to 30 g dm-3, and also changed the composition of the methanogenic consortium. A partial recovery in the numbers of proteolytic and methanogenic bacteria coupled with the decrease in the density of sulphate-reducers was observed. High concentrations (more than 50 g dm-3) of NH4Cl seemed to cause irreversible inhibition of methanogenesis which could not be eliminated by the addition of phosphorites.

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Keywords

Ammonia inhibition, Anaerobic digestion, Methanogenic consortium, Phosphorite ore, Poultry manure